On the evening of the same day ♄ the astronomical 5th, with the reflecting telescope, power 100, observed an emersion of Jupiter's 2d satellite at $9^h\ 44'\ 42''$ per clock; the above correction being applied, we shall have for the moment of the visible emersion, $9^h\ 44'\ 22''\ 35$, mean time. Clouds were passing and a vapour obscured, in some degree, the disk of the planet, similar to that of the 11th of June, though rather more dense, and it is thought probable, that the emersion was seen too late by 20 or 30 seconds: the longitude deduced without correction would be $6^h\ 5'\ 0''$ west of Greenwich.

☉ July 6th, astronomical time, observed with the reflector, power 100, an emersion of Jupiter's first satellite, at $8^h\ 12'\ 24''$ per clock, and the correction for the rate of the clock being applied, the visible emersion took place at $8^h\ 12'\ 4''\ 81$, mean time, the longitude deduced would be $6^h\ 5'\ 12''\ 19$.—Now as the density of the vapour of this evening and that of the 11th of June are supposed to be equal, and that the one observation was an immersion and the other an emersion of the same satellite, the imperfection of vision caused by the vapour or by the great and strong light of the planet, so near to the points of observation, would produce errors in contrary directions, the one advancing, the other retarding the moment of visible contact, a mean of the two results will therefore probably be near the truth.

| | | | | |
|---|---|---|---|---|
| Result of the immersion of the 11th of June. . . . . . | $6^h$ | $5'$ | $41''$ | 4 |
| Result of the emersion of the 6th of July. . . . . . . | 6 | 5 | 12 | 19 |
| Mean longitude. . . . . . . . . . . . . . | 6 | 5 | 26 | 8 |

## No. XLIII.

*Observations of the eclipse of the sun, June 16th, 1806, made at Kinderhook, in the State of New-York, by Jose Joaquin de Ferrer.*

Read August 15th, 1806.

ACCORDING to the latitudes and longitudes of the moon inserted in the French connoissance de temps, the conjunction ought to have happened $4^h$ 29′ 40″ 8, mean time in Paris, latitude of the moon in conjunction 19′ 19″ N.

Latitude of Albany 40° 42′ 38″. Longitude east of New-York, according to the chronometer, No. 63, in time = 58″, the maximum of the total obscurity ought to have taken place in latitude 42° 23′ on the bank of the North river.—The following are the results of an approximated calculation.

| | h ′ ″ | |
|---|---|---|
| Beginning of the eclipse in mean time. | 9 49 00 | First contact 45° to the left of the inferior vertex, by inverse vision. |
| Ditto of total obscurity. . . . . | 11 06 30 | |
| End of total obscurity. . . . | 11 11 30 | |
| End of the eclipse. . . . . . | 0 33 00 | |

On the 8th of June I embarked in a packet for Kinderhook south landing, which is 15 geographic miles south of Albany on the bank of the river Hudson, to observe the eclipse, taking for that purpose an excellent chronometer of Arnold, No. 63; a circle of reflection; and an achromatic telescope, constructed by Troughton according to particular directions.

The circle of reflection is not a multiplier, it is 11 English inches diameter, graduated upon silver, with three indexes, which divide the circle into three equal parts, and sub-divide it to 10″; mounted on a pedestal, and the telescope magnifies 17 times. A complete, or double observation is a compound of two observations, one direct, the other inverse, each observation has three readings, consequently the error of the divisions, in the double observations, is reduced to $\frac{1}{6}$, the eccentricity destroyed, as also the error of the index, coloured glasses, small speculum, and of almost the whole of the large one.

The telescope is $4\frac{1}{2}$ feet in length, it has a triple object glass of $2\frac{70}{100}$ inches aperture, a terrestrial eye glass, and three astronomical ones No. 1, 2, 3, and from the manner in which it is mounted, the zenith may be observed with as much exactness as any other elevation.

Rate of going of the chronometer in New-York.

| | ′ ″ | |
|---|---|---|
| June 4th, slower than mean time. . | 11 16 5 | mean daily loss = 0″ 5 |
| 6th, . . . . . . . | 11 17 0 | |
| 8th, . . . . . . . | 11 18 5 | |

On the 10th of June I arrived at Kinderhook south landing, the place where it was intended to observe the eclipse. By observations of meridian altitudes of the sun and stars, the latitude of the place was ascertained as follows.

| | | ° | ′ | ″ |
|---|---|---|---|---|
| June 12th. | By double altitudes inverse and direct of ursa minor. | 42 | 23 | 11 |
| 12th. | ditto. . . ditto. . Antares. | 42 | 23 | 18 |
| 13th. | By one meridian altitude of ⊙, direct observation. | 42 | 22 | 54 |
| 13th. | ditto. . . . ursa minor. | 42 | 23 | 00 |
| 14th. | By double altitudes direct and inverse, 50′ of time before and after the meridian. | 42 | 22 | 53 |
| | Mean latitude. | 42 | 23 | 03 |

Rate of going of the chronometer according to mean time, by corresponding altitudes of the sun.

| | | ′ ″ | |
|---|---|---|---|
| June 11th. | Chronometer too slow. | =12 09 9 | daily gain. =1″ 18 |
| 12th. | | 12 08 4 | |
| 14th. | | 12 06 2 | |
| 15th. | | 12 05 0 | |
| 16th. | | 12 04 0 | |

Observation of the eclipse, 16th of June, 1806, with the achromatic telescope, $2\frac{7}{100}$ English inches aperture, triple object glass No. 1, was used which magnifies 90 times.

$9^h\ 37'\ 33''$, (chronometer.) Beginning 45° from the left inferior vertex, in the very point on which the eye was fixed, the impression was so slight, that 4″ elapsed before it was certain that it had commenced.

$10^h\ 55'\ 58''$, (chron.) First interior contact or total obscurity, certain to half a second, 50° from the right superior vertex: 4″ or 5″ before the total obscurity, the remainder of the disk of the sun was reduced to a very short line, interrupted in many parts.—The darkened glass with which this phenomenon had been observed, was sufficiently clear to distinguish terrestrial objects. After this observation I laid aside the coloured glass, to observe the end of total darkness. I examined the moon during two minutes, without observing one luminous point in her disk. The disk had round it a ring or illuminated atmosphere, which was of a pearl colour, and projected 6′ from the limb, the diameter of the ring was estimated at 45′. The darkness was not so great as was expected, and without doubt the light was greater than that of the full moon. From the extremity of the ring, many luminous rays were projected to more than 3 degrees distance.—The lunar disk was ill defined, very dark, forming a contrast with the luminous corona; with the telescope I distinguished some very slender columns of smoke, which issued from the western part of the moon. The ring appeared concentric with the sun, but the greatest light was in the very edge of the moon, and terminated confusedly at 6′ distance.

11ʰ 00′ 26″, (chron.) Observed the appearance of a ribbon or border, similar to a very white cloud, concentric with the sun, and which appeared to me to belong to its atmosphere, 90° to the left of the moon.

11ʰ 00′ 28″, (chron.) Observed the illumination of various points in the disk of the moon on the same side.

11ʰ 00′ 30″, (chron.) The illumination of the moon was very distinguishable, shewing the irregularities of its disk, the colour of a palish yellow.—In the moment of the sun's re-appearance, the versed sine of the illuminated segment of the moon, was equal to $\frac{1}{6}$ part of the apparent diameter of Jupiter, observed in opposition with the same tube,

11ʰ 00′ 34″ 8, (chron.) End of total darkness, 90° on the left; the sun appeared as a very bright star of the third magnitude; at the call of the 35″, such was the intensity of the light that I abandoned the telescope, having received a violent impression on the eye: from the appearance of the first ray, to the moment when it became insupportable to the eye, was so instantaneous, that I have estimated it at less than $\frac{3}{10}$ of a second. It is to be remarked, that this observation was made without a darkened glass, with *tube No.* 1, which magnifies 90 times, and is remarkably clear.

0ʰ 21′ 38″, (chronometer.) End of the eclipse.

During the whole of the eclipse, the sky was very clear, not a single cloud was visible, and there was scarcely any wind. The sun was without a spot. A little dew fell during the darkness; five or six principal stars and planets were visible.

Mr. John Garnett (of New-Brunswick, New-Jersey,) who also observed the eclipse with an excellent telescope of Dolland, with a triple object glass, and $2\frac{7}{100}$ inches aperture, tube No. 1, of the same power as the one I used, was placed four or five paces from the person who counted aloud the seconds of the chronometer. Mr Garnett, besides being a good astronomer, was much accustomed to the use of the telescope.—He directed his view to the 45° on the left of the inferior vertex, inversed vision, according to a previous calculation, and determined the following phenomena.

| | Chronometer. h ′ ″ |
|---|---|
| Commencement of the eclipse. | 9 37 36 |
| Total darkness. | 10 55 58 |
| Illumination of the lunar disk, which he observed without a darkened glass | 11 00 28 |
| End of the eclipse. | 00 21 41 |

Owing to an accident he did not observe the end of total darkness.

Mr. Garnett is positive, that the end observed is correct to a second, and that the impression was sensible to him three seconds previous.—We have then,

| | Chronometer. h ′ ″ | Mean time. h ′ ″ | Siderial time. h ′ ″ |
|---|---|---|---|
| Commencement. | 9 37 33 | 9 49 37 | 3 26 19 7 |
| Total darkness. | 10 55 58 | 11 08 02 | 4 44 57 5 |
| End of ditto. | 11 00 35 | 11 12 39 | 4 49 35 0 |
| End of the eclipse. | 21 41 | 33 45 | 6 10 54 8 |

The interior contacts were instantaneous, consequently they may be ascertained at least to half a second; the beginning to less than 3″, and the end according to M. Garnett to 1″.

June 16th. Equal altitudes of the sun.

| | A. M. h ′ ″ | P. M. h ′ ″ | M. h ′ ″ |
|---|---|---|---|
| Chronometer. | 7 11 06 0 | 4 25 04 7 | 11 48 05 35 |
| | 7 16 08 9 | 4 19 59 0 | 11 48 03 95 |
| | 7 20 44 1 | 4 15 24 2 | 11 48 04 15 |
| | 7 26 56 3 | 4 09 11 8 | 11 48 04 05 |
| | 7 30 22 0 | 4 05 44 3 | 11 48 03 15 |
| | 7 37 44 0 | 3 58 24 7 | 11 48 04 35 |
| A mean of these gives noon uncorrected | | | 11 48 04 17 |
| Equation of equal altitudes. | | | — 1 27 |
| Apparent noon by the chronometer. | | | 11 48 02 90 |
| Equation of time. | | | + 6 98 |
| Chronometer slower than mean time. | | | 00 12 04 08 |

| Chronometer. h ′ ″ | ☉'s true altitude. ° ′ ″ |
|---|---|
| 7 13 11 37 | 30 53 54 |
| 7 20 44 10 | 32 17 18 |
| 7 26 56 30 | 33 26 06 |
| 4 09 11 80 | 33 26 04 |
| 4 11 17 10 | 33 03 03 |
| 4 15 24 20 | 32 17 17 |

| | |
|---|---|
| Chronometer slower than mean time, by the ☉'s altitudes at noon. | 12′ 04″ 10 |
| By the equal altitudes. | 12 04 08 |
| Mean | 12 04 09 |

The above altitudes of the sun are the result of direct and inverse observations, corrected for refraction and parallax.

June 18th, we embarked in a packet for the house of Chancellor Levingston, which is on the bank of the river, and by two direct observations of meridian altitudes on the 19th and 20th, the latitude of said house appears to be 42°. 04′ 39″

| | |
|---|---|
| Chronometer slow with respect to mean time, by three series of complete observations of altitudes of the sun 19th of June in the morning. | 11′ 34″ 8 |
| By three series, 20th, ditto. . . . . . . . | 11 33 2 |

June 21st, we embarked for New-York, and having put into Newburg on account of the wind, I observed the latitude from the wharf of that town, from a meridian altitude of the sun, and found it to be 41° 30′ 20″.

By four series of altitudes of the sun, taken in the afternoon of the 22d of June, the chronometer was slow with respect to mean time $0^h$ 11′ 11″ 50.

June 23d, we arrived at New-York.—By observations of altitudes of the sun in Partition street, the chronometer was ascertained to be slow with respect to mean time,

June 24th. . . 11′ 09″ 3
July 4th. . . . 11 17 5

If we compare the absolute state of the chronometer from the day of departure to the 24th, when I returned to this city, it will appear that in 16 days the gain was = 9″ 2, daily gain, $= \frac{9'' 2}{16} = 0'' 571$

| | |
|---|---|
| Mean gain between the observations of New-York before our departure, and the observations of Kinderhook. . . . | . 0″ 35 |
| Between Kinderhook and the observations at New-York on our return. | . 0 25 |

| | ° | ′ | ″ | | Long. in time. ″ |
|---|---|---|---|---|---|
| Latitude of New-York, Partition street. . . . | 40 | 42 | 40 | Longitude | 00 |
| Newburg. . . . . . . . . . | 41 | 30 | 20 | East. | 2 |
| House of Chancellor Levingston. . . . . | 42 | 04 | 39 | East. | 23 6 |
| Kinderhook, S. landing, where the eclipse was observed | 42 | 23 | 03 | East. | 51 3 |
| Albany, Pomerat's Hotel. . . . . | 42 | 38 | 38½ | East. | 58 |

The position of Albany I determined last year, in the month of August, with the same chronometer and circle of reflection, and its correctness is to be depended upon, as much as that of the other observations. The rate of going of the chronometer was, with a very slight difference, the same as it was found to be this year; from the 4th of August, 1805, the day the chronometer was taken out of New-York for Albany, to the 15th that it was again examined, on my return to New-York, the daily gain was = 0″ 54.

Elements calculated by the astronomical tables of Lalande, third edition.

16th of June 1806, 4h 29′ 40″ 8 mean time in Paris.

| | | ° ′ ″ |
|---|---|---|
| Longitude of the ☾ apparent equinox. | | 84 44 31 1 |
| Idem ☉ idem. | | 84 44 34 3 |
| Northern latitude of the ☾ | | 19 24 0 |
| Horizontal parallax for Paris. | 60′ 13″ 4 | |
| Correction of the tables. | — 4 5 | |
| Horizontal parallax for Paris. | 60 08 9 | |
| Horizontal parallax of the ☉ | 8 5 | |

| | | | ′ ″ |
|---|---|---|---|
| Horary motion of the ☾ in longitude. | 36 41 92 | in Lat. = | 3 22 86 |
| The hour that precedes. | 36 41 24 | | 3 22 80 |
| The hour that follows. | 36 42 60 | | 3 22 92 |
| Horary increase of the horizontal parallax of the ☾ | 1 16 | | |
| Horizontal semidiameter of the ☾ | 16 26 96 | | |
| Horary increase of the horizontal semidiameter of the ☾ | 0 26 | | |
| Horizontal semidiameter of the ☉ | 15 46 08 | | |
| Horary motion of the ☉ | 2 23 16 | | |
| Right ascension of the ☉ | 5h 37 05 2 | | |
| Horary variation in right ascension of the ☉ | 10 4 | | |
| Proportion of the axes of the earth | 334 to 333 | | |
| Latitude of Kinderhook—Vertical angle | =42° 12 47 | | |

| | ′ ″ |
|---|---|
| Relative horary motion between the commencement and conj. in Kinderhook | 34 17 52 |
| the end and conjunction | 34 19 62 |
| 1st interior contact and the conjunction. | 34 18 54 |
| 2d interior contact and the conjunction. | 34 18 60 |
| Apparent obliquity of the ecliptic. | 23 27 56 |

The epoch of the lunar tables I have corrected according to the equations of De Burg, which in 1806. = 1s 15° 07′ 11″ 4 + 11″ 5 — 1″ 4
Mean anomaly. 3 25 37 27 + 46 — 1 4

To calculate the latitude, I have diminished the inclination of the lunar orbit, 6″, and have further applied the correction = —6″ sine long. ☾.

☾'s Horizontal parallax for Kinderhook = (60′ 08″ 9—1″ 2 on account of the spheroidal figure of the earth,) = 60′ 10″ 1.

Difference of horizontal parallaxes of the of the ☉ and ☾ = 60′ 02″ 6

| | h ′ ″ | h ′ ″ | h ′ ″ | h ′ ″ |
|---|---|---|---|---|
| June 16, 1806. At Kinderhook south landing, mean time. | 9 49 37 | 11 08 02 | 11 12 39 | 0 33 45 |
| Longitude West of Paris. | 5 04 50 | 5 04 50 | 5 04 50 | 5 04 50 |
| Mean time in Paris. | 2 54 27 | 4 12 52 | 4 17 29 | 5 38 35 |
| Right ascen. of the mid-heaven. | 51 34 56 | 71 14 22 | 72 23 52 | 92 43 42 |
| Latitudes of the ☾ by the tables. | 24 46 0 | 20 20 86 | 20 05 27 | 15 30 94 |

| | | | | |
|---|---|---|---|---|
| | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| Altitudes of the nonagesimal. | 67 20 23 | 70 18 06 | 70 24 58 | 71 14 00 |
| Longitudes of the nonagesimal. | 60 05 00 | 75 20 39 | 76 14 50 | 92 08 02 |
| Dist. of the ☾ to the nonag. | +23 41 18 | +9 13 35 | +8 22 13 | —6 41 21 |
| Horizontal parallaxes of the ☾ —par. of the ⊙ in Kinderhook. | 60 01 7 | 60 02 3 | 60 02 3 | 60 03 9 |
| Parallaxes in longitude. . | +22 34 50 | + 9 12 20 | + 8 21 60 | — 6 44 50 |
| Parallaxes in latitude. . | —23 05 5 | —20 13 7 | —20 07 11 | —19 23 95 |
| Apparent latitudes of the ☾ | N. 1 40 5 | N. 7 1 | S. 1 80 | S. 3 52 00 |
| Inclination of the orbit in the interior contacts. | | 4 49 30 | | |
| Chord. . . . . . . | | 1 48 16 | | |
| Apparent semidiameter of the ☾ not corrected for inflection. | 16 41 15 | 16 42 95 | 16 43 02 | 16 43 58 |

In Albany the eclipse was observed by Mr. Simeon de Witt.

| | h ′ ″ |
|---|---|
| Beginning, apparent time . . . . . . . . | 9 50 12 |
| 1st interior contact . . . . . . . . . . | 11 08 06 |
| 2d ditto. . . . . . . . . . . . | 11 12 57 |
| End of the eclipse. . . . . . . . . . . | 33 09 5 |

M. De Witt did not apply the correction of corresponding altitudes, on account of the variation in the sun's declination, and in this case we have the observations as follows.

| | | | |
|---|---|---|---|
| $9^h$ | 50′ | 13″ | 1 |
| 11 | 08 | 07 | 1 |
| 11 | 12 | 58 | 1 |
| | 33 | 09 | 1 |

The end of total darkness was observed by the naked eye, the other observations were made with a telescope which magnified 30 times.—It is observable that the end of total darkness was so instantaneous, (as is expressed in my account,) that the error made between the observations, made by the best telescope and the naked eye, could scarcely amount to half a second.

Latitude of Albany as stated in my observations, page 269, is 42° 38′ 38½″.—Longitude east of New-York by chronometer No. 63 in time = 58″

The beginning and end of the eclipse at Albany do not appear to have been correctly ascertained, which it is easy to see by reference to calculation.

The interior contacts are to be depended upon.—It results therefore from the interior contacts at $11^h$ 08′ 07″ 1 Parallax in long. 9′ 06″ 9 Parallax in lat. = 20′ 29″ 8
11 12 58 1 ditto 8 14 1 ditto 20 22 6
Inclination of the apparent orbit = 4° 30′ 35″ Chord = 1′ 53″ 00

In Lancaster it was observed by Mr. Andrew Ellicott.

| | |
|---|---|
| Beginning in mean time. | 9h 33′ 14″ |
| End. | 0 19 02 |
| Latitude of Lancaster—Vertical angle | =39° 52′ 27″ |

| | ′ ″ | | ′ ″ |
|---|---|---|---|
| Parallaxes of Longitude | 26 13 0<br>3 55 8 | Parallaxes of Latitude = | 21 43 5<br>16 54 2 |

In Philadelphia by Mr. Robert Patterson, corrected Latitude = 39° 46′ 53″

| | |
|---|---|
| Beginning in apparent time | 9h 39′ 59″ 0 |
| End | 0 25 48 9 |

| | ′ ″ | | ′ ″ |
|---|---|---|---|
| Parallaxes in Longitude = | +25 08 9<br>− 5 22 4 | Parallaxes in Latitude= | −21 16 9<br>−16 53 3 |

On the banks of Schuylkill, in the western part of the city by F. R. Hassler, west of the State House in time 7″

| | |
|---|---|
| Corrected Latitude | 39° 46′ 53″ |
| Beginning, apparent time | 9h 39′ 48″ 5 |
| End | 0 25 48 9 |

| | ′ ″ | | ′ ″ |
|---|---|---|---|
| Parallaxes in Longitude = | +25 11 5<br>− 5 18 0 | Parallaxes in Latitude= | 21 16 6<br>16 53 9 |

Mr. Dunbar, at his plantation latitude 31° 27′ 48″, longitude 6h 14′ 50″, at 4½ miles east of the river Mississippi, near the Natchez, 8 miles distance, 9″ in time east from the fort of Natchez.

| | | |
|---|---|---|
| Beginning. | 20h 05′ 29″ mean time. | The Telescope magnified 40 times. |
| End. | 22 38 55 idem. | |

| | ′ ″ | | ′ ″ |
|---|---|---|---|
| Parallaxes in Longitude = | +42 41 9<br>+17 55 7 | Parallaxes in Latitude= | 19 44 6<br>10 08 2 |

By the observations of Kinderhook.

| | |
|---|---|
| The latitude of the ☾ in conjunction | =19′ 35″ 8 |
| Inflection of the semidiameter of the ☾ | = −2 05 |
| Ditto. ☉ | = −1 95 |

From these elements I have calculated the following table.

The longitude of Philadelphia I have supposed to be 5h 09′ 57″ west of Paris, and that of New-York 5h 05′ 25″ 4. By the combination of different observations with these data, and the differences of longitude resulting from the different observations of the eclipse, I have determined the longitudes of Mr. Dunbar's house near Natchez, and of Lancaster.—That of Albany I have determined from the mean result of the chronometer and eclipse.

The situation of the house of Chancellor Levingston and of Newburg are ascertained by the chronometer referred to Kinderhook and New-York.

| | | Mean time of Observations. h ′ ″ | Parallax in Longitude. ′ ″ | Parallax in Latitude. ′ ″ | Conjunction in mean time. h ′ ″ | h ′ ″ |
|---|---|---|---|---|---|---|
| Kinderhook South landing. | Commencement of the eclipse. | 9 49 37 | + 22 34 5 | + 23 05 5 | 11 25 40 9 | 11 25 39 5 |
| | Total darkness. | 11 08 02 | + 9 12 2 | + 20 13 7 | 11 25 39 5 | |
| | End of total darkness. | 11 12 39 | + 8 21 7 | + 20 07 2 | 11 25 39 5 | |
| | End of the eclipse. | 0 33 45 | − 6 44 5 | + 19 22 9 | 11 25.38 1 | |
| Albany, observed by Mr. S. de Witt. | Total darkness. | 11 08 13 7 | + 9 06 9 | + 20 29 4 | 11 25 48 0 | 11 25 48 0 |
| | End of total darkness. | 11 13 04 7 | − 8 14 1 | + 20 22 7 | 11 25 48 0 | |
| Philadelphia, by Robert Patterson Esq. | Commencement of the eclipse. | 9 40 04 9 | + 25 09 9 | + 21 16 9 | 11 20 22 0 | 11 20 17 8 |
| | End of the eclipse. | 0 26 14 8 | − 5 22 4 | + 16 53 3 | 11 20 13 0 | |
| Bowdoin College by Rev. Dr. M'Keen. | End of the eclipse. | 0 55 27 0 | − 10 47 8 | 21 03 0 | 11 40 56 2 | |
| On the banks of Schuylkill, by Mr F. R. Hassler. | Commencement of the eclipse. | 9 39 54 4 | + 25 11 5 | + 21 16 6 | 11 20 13 0 | 11 20 07 0 |
| | End of the eclipse. | 0 25 56 2 | − 5 18 2 | + 16 53 9 | 11 20 01 0 | |
| Lancaster, by Andrew Ellicott, Esq. | Commencement of the eclipse. | 9 33 14 0 | + 26 13 0 | + 21 43 5 | 11 15 24 5 | 11 15 26 9 |
| | End of the eclipse. | 0 19 02 0 | − 3 55 8 | + 16 54 2 | 11 15 29 3 | |
| At the Forest near Natchez by William Dunbar, Esq. | Commencement of the eclipse. | 8 05 29 0 | + 42 41 9 | + 19 44 6 | 10 15 21 9 | 10 15 21 9 |
| | End of the eclipse. | 10 38 55 0 | + 17 55 7 | + 10 08 2 | 10 15 21 9 | |
| Williamsburg, by Rev. James Madison. | End of the eclipse. | 0 15 06 8 | − 3 09 8 | + 14 07 9 | 11 13 08 2 | |

| | h ′ ″ | | ° ′ ″ |
|---|---|---|---|
| Albany west from Paris. | 5 04 24 5 | Latitude= | 42 38 38 |
| Kinderhook south landing. | 5 04 33 0 | . . | 42 23 03 |
| Chancellor Levingston's Place. | 5 05 01 2 | . . | 42 04 39 |
| Newburg. | 5 05 22 8 | . . | 41 30 20 |
| New-York. | 5 05 24 8 | . . | 40 42 40 |
| Philadelphia. | 5 09 56 5 | . . | 39 57 02 |
| Lancaster. | 5 14 42 0 | . . | 40 02 36 |
| Forest near Natchez. | 6 14 50 5 | . . | 31 27 48 |
| Williamsburg. | 5 17 04 3 | . . | 37 15 50 |
| Bowdoin College, in the District of Maine. | 4 49 16 4 | . . | 43 52 00 |

| | | |
|---|---|---|
| Albany east from Kinderhook south landing by the chronometer in time. | 6″ 7 | |
| by the eclipse. | 8 5 | |
| Mean. | 7 6 | |
| Albany and New-York by the chronometer. | = | 58″ |
| Kinderhook west from Albany. | | 7 6 |
| Kinderhook and New-York. | | 50 4 |
| By the chronometer. | | 51 3 |
| Kinderhook south landing and New-York. | | 50 8 |
| Albany and New-York. | | 58 4 |

Fig. 1 in Plate VI, represents the total eclipse, I shall only remark, that the luminous ring round the moon, is exactly as it appeared in the middle of the eclipse, the illumination which is seen in the lunar disk, preceded 6″ 8 the appearance of the first rays of the sun. Two minutes previous to the emersion, I had fixed my eye on the point from whence it was to proceed, and as the field of the telescope did not embrace more than a third part of the disk, I could not observe whether or not the circumference of the ring was diminished on the opposite side.—In the part where the emersion took place, the ring was illuminated by degrees, and the atmosphere was more dense and brilliant near the edge of the moon. A little before the illumination of the lunar disk, I observed a zone to issue concentric with the sun, similar to the appearance of a cloud illuminated by the rays of the sun, and as it is represented in the figure, the versed sine of which was very nearly equal to that of the illuminated part of the moon.—We have seen that the radius of the luminous ring was $22\frac{1}{2}$ minutes, the horizontal semidiameter of the moon deducting the inflection 16′ 23″ 8, and the horizontal equatorial parallax at the time of conjunction =60′ 15″. With these elements if we suppose the ring to be the visible atmosphere of the moon, it would follow, that the height of the lunar atmosphere, would be 348 geographical miles above its surface, which is fifty times more extensive than the atmosphere of the earth. It will moreover appear, that such an atmosphere cannot belong to the moon, but must without any doubt belong to the sun.

If the moon possessed such an atmosphere, it would be manifested by a diminution of the duration of eclipses, and occultations.—We have seen that the diminution of the semidiameter of the moon resulting from the observations of this eclipse is 2″ 5, by comparing it with various occultations which I have calculated, the inflection appears to be 2″, it may be the effect of the irradiation of light, but supposing it even to be caused by the horizontal refraction of the moon, we know that the inflection is double the horizontal refraction. The horizontal terrestrial refraction, is nearly 33′, therefore the density of the atmosphere of the earth, is 1980 times more than that of the moon.—*We must conclude that so rare an atmosphere cannot cause any evaporation.*

Some of the lunar mountains are $1\frac{1}{4}$ miles high, and we can clearly perceive them with a telescope, which magnifies 100 times, and it is constantly observed, that the spots and inequalities of the superficies of the moon, are always seen in the same form, whence it follows, that there can be no cloud which covers even one mile in extent. Again, it has been observed that the edges of the moon emit more light than the centre, which is the very reverse of what happens in the sun, comets and planets, of which the centres are more luminous than the edges, on account of their being surrounded by atmospheres.

It has appeared to me, that the cause of the illumination of the moon, as noticed above, is the irradiation of the solar disk, and this observation may serve to give an idea of the extension of the luminous corona of the sun. Suppose then that there is no density in the lunar atmosphere.—By the preceding calculations, the apparent relative inclination of the orbits between the interior contacts was 4° 49′ 30″, the duration of the total obscurity 4′ 37″ and the relative apparent chord 1′ 48″ 16.

Moreover, the illumination preceded the emersion 6″ 8; we have therefore very nearly the irradiation of the semidiameter

$$\text{of the } \odot = \frac{1'\ 48''\ 16 \times 6''\ 8}{4'\ 49''\ 30} = 2''\ 6.$$

## No. XLIV.

*Observations on the solar eclipse of June 16th, 1806, made at Bowdoin College in the District of Maine. Communicated by a member of this Society to Mr. John Vaughan.*

Read March 6th, 1807.

YOU ask for the result of the observations made at Bowdoin College, (in the township of Brunswick and district of